

Electrochemical polishing

Our best solution for
highest demands.

Why Electropolishing?

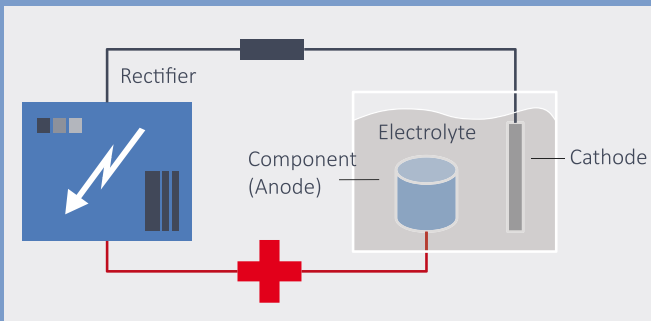
The benefits of the electropolished surfaces compared to the mechanically processed surfaces are various. Electropolishing is intended to achieve the following properties:

- | Smooth and bright surfaces
- | High corrosion resistance
- | Metal purity and chemical passivity
- | Optimal cleaning properties
- | Lack of particles and pyrogen strength
- | Quality control by detection of treatment and material defects (defectoscopy)
- | Deburring in the micro and macro ranges
- | Significantly reduced affinity to coating
- | Definite reduction of gas condensation
- | Optimal weldability and solderability
- | Reduced friction and abrasion

How Does it Happen?

In fact, the procedure is the reversal of the galvanic process. Under the influence of continuous current, metal is removed from the components surface within an electrolyte (solution with high conductivity, e.g. phosphoric and sulphuric acid base for a number of stainless steel alloys). The component to be polished is the positive pole (anode) and the cathode is the negative pole, which completes this electric cell. If the current flow is switched on, the metal is removed from the anodic

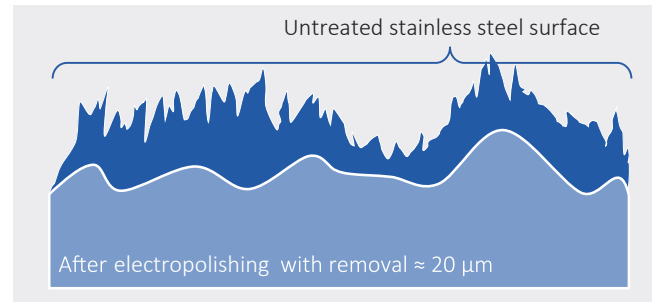
Schematic Diagram of the Electropolishing Process



surface, and solubizes within the electrolyte. The material removal can be exactly specified by the particular electrolyte, the current density, and the duration of polishing. Therefore the selection of the electrolyte solution according to the material is decisive.

One of the characteristics of electrochemical material removal is that the process starts only under current, and therefore polishing can be performed with very high precision in accordance with the designated target. In addition, the material can be selectively removed by adapting the cathodes for each component – depending on the customer demands.

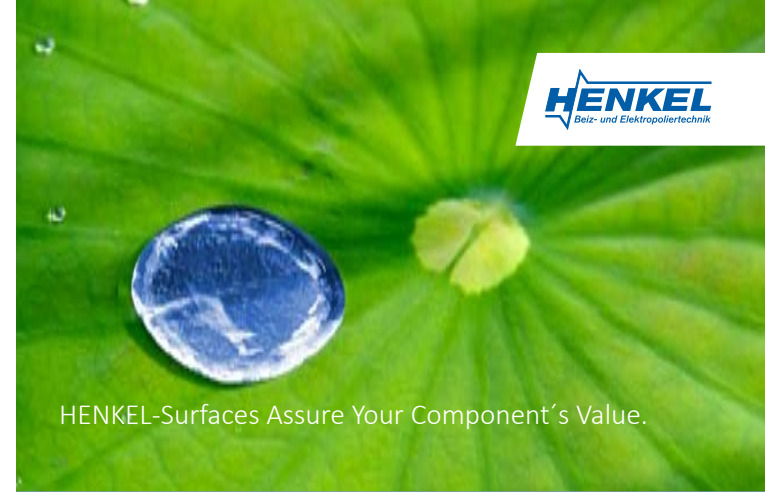
Schematic Representation of the Surfaces' Micro Smoothing During the Electropolishing Process



What is Possible?

Depending on the specific use of the component it is advisable to distinguish the surface specifications. Is it an optical or functional surface? Depending on the requirements, even a simple brightness through the electropolishing can be sufficient. However, a specific roughness value (roughness average Ra) is often defined during industrial application, which has to be achieved with specific material removal.

Typical material removal values of professional electropolishing are between 10 and 35 μm. However, the values depending on the pre-treatment of the starting material and its surface.



HENKEL-Surfaces Assure Your Component's Value.

Our Service Range.

- | On-site and factory service
- | Electrochemical polishing
- | Anodic cleaning
- | Chemical polishing / deburring
- | Chemical pickling and passivation
- | Professional cleaning (also in clean room)
- | Derouging and repassivation
- | Process and cleaning chemicals
- | Documentation
- | Construction



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In Practise.

Electrochemical polishing (EP) can be achieved in different ways during the industrial application. The procedure to be followed depends on both, the parts and economic aspects. Below a few examples:

Barrel-EP



Tank-EP



Bath-EP



Wipe-EP



Tube-EP



EP-Automat



Materials.

Each material has its own properties. The composition of the metal alloy significantly affects suitability for electropolishing. The HENKEL electrolytes support the following materials, among others:

Stainless steels (e.g. 1.4435, 1.4404/316L, 1.4539/904L etc.), duplex stainless steels, nickel and nickel alloys (e.g. Alloy 59, Hastelloy®, Inconel®), aluminium, copper, niobium, titanium and titanium alloys (e.g. Nitinol), zirconium, tantalum.

Components.

Electrochemical processing is limited only by very few aspects. If a cathode can be contactless introduced into the component, then it is suitable for electropolishing. Frequently occurring examples in operation are:

Tubes, fittings, special components, heat exchanger tubes/plates, valves, pumps, stencils, storage tanks, mixing vessels and batching tanks, cryostats, fermenters, stirring devices and built-in components, reactors, installations as well as complete systems etc.

Application Range.

The possible applications of electrochemical polishing are various, just as in the case of stainless steel. Typical fields of use are:

Pharmaceutical industry, chemical industry, biotechnology, semi-conductor industry, food and beverage, cosmetics, power plants, refrigerator and heat engineering, medical technique, aerospace, architecture etc.



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